

Pattern Variation Method to Detect Lie Using Artificial Neural Network (PVMANN)

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Abstract—This beautiful world is a collection of variety of people. They have different sort of mind. Some people always speak the truth. Some hardly have the habits to tell the truth. If a person is guilty then he or she must try to save him or herself and conceal his or her sin. If a system can be designed to detect lie then a genuine and trusty counseling can be done for the establishment of the truth. This paper contains an algorithm PVMANN which makes a gateway to detect a person's truthfulness.

Keyword—Lie detection, Artificial Neural Network (ANN), Pattern, Perceptron, Segmentation

I. INTRODUCTION:

This algorithm is based on untrained data and it is a basis of unsupervised learning by Artificial Neural Network [1]. A person will be asked five questions having answering options as 'yes' or 'no'. Evidently the method will treat the answers as Binary (1 or 0). Same questions will be asked in different five days. His current answer will be compared with his first or earliest answers. If any difference occurs then he or she will be treated as a liar.

II. SIMILAR STUDIES

Mic Hanlon scientists at Manchester Metropolitan University that interprets facial gestures could be the most accurate "lie detector" using just a laptop and a camera [2].

Patrick Kennedy used Artificial intelligence to detect lies via tiny changes in facial expressions [3].

Mark Williams Pontin on April 21, 2009 made review on lie detection based on facial expressions [4].

Leonard Saxe, PhD, Psychologist (1991) has argued, the idea that we can detect a person's veracity by monitoring psycho physiological changes is more myth than reality. Even the term "lie detector," used to refer to polygraph testing, is a misnomer. So-called "lie detection"[5].

John P. Clark and Larry L. Tiff American Sociologist worked for Polygraphic validation on lie detection [6].

This paper is divided into two sections. Section 1 discusses methodology and Section 2 discusses the algorithm.

III. METHODOLOGY

An Artificial Neural Network has been depicted figure 1. It consists of five input vectors x_1, x_2, x_3, x_4, x_5 and w_1, w_2, w_3, w_4, w_5 are five weights for those five input vectors. Those all weights are fixed to 1. These input vectors are answers collected from an individual in five sets. The first set of answers that given by the an individual are stored as initial pattern which will help to calculate the threshold i.e. the difference of initial and current set of answers. The difference justifies the truth of his reply.

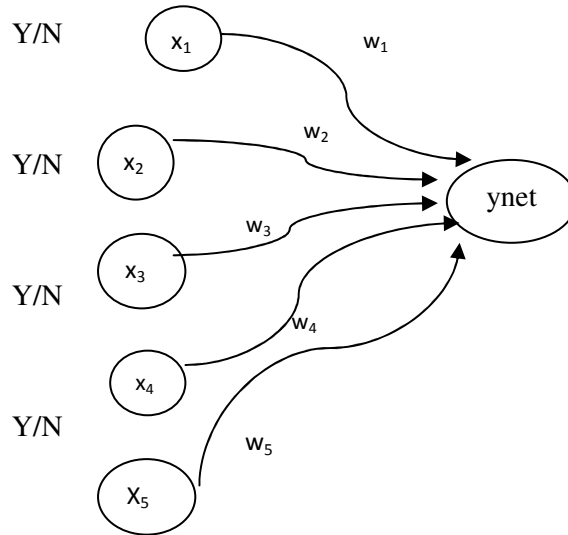


Figure 1: Basic ANN

The questions are given below:

Q no: 1) Are you under Fourteen?

Q no: 2) Have you scored more than 60% marks in previous standard?

Q no: 3) Can you operate Computer?

Q no: 4) Can you play Badminton?

Q no: 5) Do you have any experience of travelling by Flight?

All the answers of the above questions have two answering options i.e. “Yes” or “No”. For “Yes” the Binary representation is 1 and for “No” the Binary representation is 0. The answers of the mentioned five questions in binary are stored in the input vectors x_1, x_2, x_3, x_4, x_5 . The net input of the ANN is calculated as follows:

$$ynet_i = \sum_{i=1}^n w_i x_i$$

$$d_i = ynet_{initial} - ynet_i$$

$$d = (\sum_{i=1}^n d_i) / n$$

$$w_i = 1$$

III. ALGORITHM

STEP 1: Declare $x[5], w[5], i, d_i[5], ynet_{ini}, ynet_i$

STEP 2: Set all $w_i x_i$ to $w[i]$ by 1 which is fixed.

STEP 3: Ask Five Questions and initialize the answers in binary in the array $x_{ini}[5]$.

STEP 4: Calculate: $ynet_{ini} = ynet_{ini} + w[i] * x_{ini}[i]$

STEP 5: Repeat Step 4 for $i=1$ to 5 for 5 set of answers.

STEP 6: Ask same questions in day 1 & store the answers in array $x[1]$.

STEP 7: Calculate $ynet_i = ynet_i + w[i] * x[i]$

STEP 8: Repeat Step 7 for $i=1$ to 5 for 5 set of answers.

STEP 9: Calculate the absolute difference from first set of answers to answers of day1

$$d_i[1] = \text{abs}(ynet_{ini} - ynet)$$

STEP 4: Repeat Step 6 to Step 9 for $i=1$ to 5 for 5 set of answers in day2, day3, day4, day 5.

STEP 6: Calculate Average Difference

$$d = (d_i[0] + d_i[1] + d_i[2] + d_i[3] + d_i[4]) / 5$$

STEP 7: Check if the difference $d=0$ then print He is true else he is liar.

STEP 8: END

IV: RESULT ANALYSIS

Initial Data: Y=1, N=0

QUESTIONS	Y/N
Are you under Fourteen?	1
Have your secured more than 60% marks in previous standard?	0
Can you operate computer?	1
Can you play Badminton?	0
Do you have any experience of travelling by Flight?	1

Answers at day 1 and Difference:

QUESTIONS	Y/N	Difference
Are you under Fourteen?	0	2
Have your secured more than 60% marks in previous standard?	1	
Can you operate computer?	1	
Can you play Badminton?	0	
Do you have any experience of travelling by Flight?	1	

Answers at day 2 and Difference:

QUESTIONS	Y/N	Difference
Are you under Fourteen?	1	2
Have your secured more than 60% marks in previous standard?	0	
Can you operate computer?	1	
Can you play Badminton?	1	
Do you have any experience of travelling by Flight?	0	

Answers at day 3 and Difference:

QUESTIONS	Y/N	Difference
Are you under Fourteen?	1	1
Have your secured more than 60% marks in previous standard?	0	
Can you operate computer?	0	
Can you play Badminton?	0	
Do you have any experience of travelling by Flight?	1	

Answers at day 4 and Difference:

QUESTIONS	Y/N	Difference
Are you under Fourteen?	0	3
Have your secured more than 60% marks in previous standard?	0	
Can you operate computer?	0	
Can you play Badminton?	0	
Do you have any experience of travelling by Flight?	0	

Answers at day 5 and Difference:

QUESTIONS	Y/N	Difference
Are you under Fourteen?	1	0
Have your secured more than 60% marks in previous standard?	0	
Can you operate computer?	1	
Can you play Badminton?	0	
Do you have any experience of travelling by Flight?	1	

Difference table:

Day 1	Day 2	Day 3	Day 4	Day 5	Average	Output
2	2	1	3	0	1.6	Liar

V: DISCUSSION

This algorithm is an attempt using Self Organizing Map (SOM), based on a simple logic of Artificial Neuron. It is an unsupervised learning technique that takes input from people and checks the habit of answering at different periods of time. But it has some limitation that if a situation arises where number of wrong answers and correct answers are same, which generates zero difference, the system shows the person is true though he is false. But it is just the beginning of thought, later a suitable modification will be performed to overcome the limitations and develop the method.

REFERENCES

- [1]. L. Fausett, "Fundamentals of Neural Networks, Architectures, Algorithms and Applications", Pearson Education, India, 2009.
- [2]. Mic Hanlon, Mathematician at Manchester Metropolitan University, Polygraphic Lie Detecting Technique. (www.gizmag.com/go/1735/)
- [3]. Patrick Kennedy, School of Professional Development (www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newssummary/news_10-3-2014-15-20-12)
- [4]. Mark Williams Pontin, contributing editor to *Technology Review* – (www.technologyreview.com/review/413133/lie-detection/page/1/)
- [5]. Saxe L, (1991), Lying, American Psychologist, "Thoughts of an applied social psychologist." 46(4): 409-15. American Psychological Association, August 5, 2004.
- [6]. John P. Clark and Larry L. Tifft, "American Sociological Review", Vol. 31, No. 4 (Aug. 1966), pp. 516-523.